Research in Plant Biology, 4(3): 10-15, 2014 ISSN : 2231-5101
www.resplantbiol.com

Regular Article

The Grass Diversity of Vagamon Hills in Kerala

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Grasses contribute tremendously to the earth's green mantle of vegetation. They are one of the most widely distributed groups of angiosperms with gross morphological complexity. Among flowering plants Gramineae, with their 10,000 species and 620 genera is the fourth largest family of the flowering plants. They owe their importance in the plant kingdom not so much to their multiplicity of species as to their ability to flourish and spread quickly in great areas of low rainfall. Many are cultivated as cereal crops, as ornamentals and as plants of medicinal and industrial importance. Grasslands form an important vegetation type in the high ranges of Western Ghats in the states of Karnataka, Kerala and Tamil Nadu, mostly between 1000-2200 m above msl. The species diversity is extremely high in grassland-forest margins that are very frequent in south Indian forest vegetation especially along Nilgiri and Anamalai - High Ranges. The grasslands of South India, especially Vagamon hills are represented as centre of Endemism due to their exceptional bio-diversity. There are 77 species of grasses recognized from the Vagamon hills. Out of the 77 Species of grasses 18 are endemic to Peninsular India. 25 Species of grasses recognized as exotic alien Species in the study area. Also this research has focused on the ecological environment of the study area.

Keywords: Grasses; Vagamon; Endemism; Gramineae; Exotic; Alien

Angiosperms are a vast group, providing dominant vegetation of the earth's surface. Among flowering plants, Gramineae are regarded as one of the most advanced families of Monocots. Comparing to the stable ecosystem of the climax vegetation of the woodlands, the grasslands, as a dynamic vegetation, posses more ecological niches and hence more species diversity. Higher number of endemic genera in Gramineae can be attributed to earlier stages in evolution and dynamism of the family. Grasslands extend over about 24% of the world's vegetation (Shantz, 1954). India harbours a large number of endemic species. Gramineae, Apiaceae, Asteraceae and Orchidaceae account for nearly 51% of generic endemism in India among which Gramineae alone accounts for 27% (Sheeba *et al*., 2011). Grasslands of South India have been studied by various workers (Augustine *et al*, 1998). These investigators have drawn attention to the typological complexities involved in the classification of the high altitude grasslands. Endemic taxa, especially narrow endemics, are more vulnerable and may get extinct due to the anthropogenic interferences (Abeli, 2010 & Rossi *et al*, 2009). The biodiversity of the Western Ghats is the main component of the biodiversity of Kerala (Sreedharan,

2 004). The high percentage of endemism in the Western Ghats resembles oceanic islands (Subramanyam & Nayar, 1974). Gramineae are the dominant family in Western Ghats (Arora, 1974, Parthasarthy, 1983, Nair& Daniel, 1986, Venu, 1998). Grassland soils contain an abundant and diverse microorganism, micro and macro fauna community (Plantureux *et al,* 2005). A key component for sustaining production in grassland ecosystems is the maintenance of soil organic matter (SOM), which can be strongly influenced by management (Richard *et al,* 2001). Soil organic matter losses due to conversion of native grasslands to cultivation are both extensive and well documented (Davidson **&** Ackerman, 1993, Kern &Johnson, 1993). Semi-natural grassland has many important roles in contributing to a multifunctional rural land use (Hopkins, 2009). Grasslands are particularly important sources of biodiversity as hosts not only to a vast number of plant species but also to vertebrate and invertebrate fauna (Hopkins & Holz, 2006). The ecological importance of grasslands are as food sources for the wildlife, and as reserves of many poorly documented herbaceous plant forms (Shetty &Vivekananthan, 1970) and their definitive role in ecological succession throws the subject of 'grasslands' again to the forefront of current environmental importance (Puri *et al,* 1989). As well as their contribution to food and feed production, pastures and meadows form specific landscape and are a habitat for many species of plants and animals, resulting in a high biodiversity referring to all living organisms existing and interacting within an ecosystem (Van wieren & Bakker, 2008). Thus, biodiversity of grassland is important not only as a tool to protect plant and animal communities, but also in sustaining their agricultural productivity.

MATERIALS AND METHODS

Study area

Vagamon hills, one of the foothills of Anamalai-High Range's centre of Endemism was surveyed regarding their grassland vegetation. Vagamon hills with rolling grasslands and patches evergreen shola like forests is selected for this study. Vagamon is globally known for its rich grass diversity (Fig.1). It is located at about 60 km from Kottayam and 65 km from Idukki in Kerala, situated at an elevation of about 1100 m above the msl. The vagamon hill station offers us a unique and a different environ in comparison to other hill stations of Kerala. It is picturesquely beautified by a chain of hills namely Thangal hill, Kurisumala and Murugan hill. The hill is notable for extensive grasslands with small patches of thick evergreen sholas.

Fig.1: TOPOGRAPHY OF VAGAMON

Collection of Plant Material

Field trips were carried out in every season and in all the representative localities of the area, and plants of same species were collected from different sites and from different habitats to observe their morphological differences. Botanical names of the plants are arranged, followed by their common name, distribution, habitat and key characters to identify grasses of vagamon hill ranges. They were brought to the St. Thomas College, Palai and Voucher Specimens were treated with 10% formalin there and the bundles were kept in tight polythene bags. After coming from study area all these specimens were spreaded out in loose papers then pressed them among blotting papers. Blotting papers were changed every day for 6-10 days so that it soaks water and moisture. Now, it is ready

to poison but since these are treated with formalin so there's no need to poison. Now these are mounted on mounting sheets (24x42 cm) and plant specimens were identified and analysed according to their Habit and conservation status (Nayar, 1980). Photographs of the major plants were taken and are also incorporated in the research (Fig. 2 & 3). Grass flora of Vagamon hills were also compared with other similar areas and the species composition has taxonomical and ecological significance.

RESULTS AND DISCUSSION

Fig.2. Major grasses of Vagamon Hills A. *Apocopis magalorensis*, **B.** *Ischaemum indicum*, **C.** *Chloris barbatus*, **D.** *Chrysopogon hackelii*, **E.** *Chrysopogon zeylanicus*, **F.** *Heteropogon contortus*, **G.** *Arundinella ciliata.*

In Vagamon, the grasslands are dominated by tall grasses like *Cymbopogon flexuosus*, *Themeda cymbaria* etc. Vagamon includes rare species like *Zenkaria elegans, Arthraxon lancifolius* etc., From the study area 77 species of grasses were collected.

Fig.3. Major grasses of Vagamon Hills H.*Jansenella griffithiana*, **I.***Oplismenus composites*, **J.***Panicum brevifolium*, **K.** *Panicum gardenerii*, **L.***Sacciolepis indicum*, **M.***Themeda triandra*, **N.** *Zenkeria elegans*, **O.***Spodiopogon rhiophorous*

Some grasses are used for thatching and for medicinal purpose. Out of the 77 species, the endemic species are very significant due to their special adaptive features (Table 1). These 18 species are Endemic to Peninsular India in the study area. This biological diversity is often measured by the magnitude of Endemic Species. 18 endemic Species is a clear

evidence of the richness of plant diversity in these hills. This is again of biological significance in the context that the present study area has been subjected to many anthropogenic activities like Agriculture and Tourism development.

Table 1. List of Endemic grass species found in Vagamon hills

Sl. No	Scientific Name	Distribution	Flowering Period	Diagnostic Characters
1	*Apocopis mangalorensis* (Hochst.)	Hill top grasslands	September-February	30-45cm high; nodes glabrous, racemes 2,spikelets similar 4x2.5mm, stamens3, style2, stigmas plumose
2	*Arthraxon lancifolius* (Trim)	Open grasslands	October – January	Culms procumbent, racemes 2,sessile spikelets 2.5-3mm long, acuminate, awn 8mm long, geniculate
3	*Arthraxon quartinianus* (A.Rich)	Moist deciduous forests	November-February	Culms 10-50cm long, leaves 1-5cm long, margin ciliate, raceme 1-3 long, sessile spikelets 3.5x1mm,awn 8mm long
4	*Chrysopogon hackelii (Hook.f.)*	Open grasslands	September-January	80-150 cm long, sessile spikelets 5×1.5mm, anther 2.5mm long
5	*Chrysopogon zeylanicus (Nees ex steud.)*	Hill top grasslands	July-December	80-150 cm long, sessile spikelets 6-8 mm long , anthers 3mm long
6	*Dimeria connivens(Hack)*	Rocky grasslands	October – December	40-50 cm high, racemes 4-6 cm long, spikelets 4.5 × 2mm,stamens 2
7	*Dimeria lawsonii(Hook.f)*	Hill top grasslands	September-January	35cm tall, raceme solitary, spikelets 4-6 mm long, glumes acuminate
8	*Garnotia elata(Arn.ex Miq.)*	Rocky grasslands	October – January	100-140 cm tall, spikelets 4mm long, glabrous, anthers 1.5mm long
9	*Ischane globosa(Thunb)*	Marshy areas	November-January	3-60 cm long, spikelets 2,5× 2mm, stamens 3, anthers 1.5-2mm long
10	*Ischane walker(Arn.ex steud.)*	evergreen forests	November-February	Culms 60-120cm high, nodes glabrous, spikelets 3-4mm long, glumes equal, stamens 3,stigma plumose.
11	*Ischaemun indicum(Houtt.)*	Forest margins	October – February	20-50 cm high, racemes 3-5 cm long, spikelet 4-5mm long,
12	*Oplismenus burmanii* (*Retz.*)	evergreen forests	August-January	Culms 30-50cm tall, panicle 5-10cm long, racemes short, spikelets 4-5mm long, ovary oblong, stigma plumose, pale yellow
13	*Panicum gardneri (Thw.)*	Semi-evergreen forests	November-May	Culms 80-100cm long, spikelets 4-5.5mm long, solitary, palea oblong, ovate, coriaceous
14	*Paspalum canarae (Steud.)*	Open grasslands	August-December	Annuals, Culms 10-30cm high, nodes hairy, racemes 8-15,Spikelets 1.2x1mm,usually paired, palea similar to lemma
15	*Setaria paniculifera (Steud.)*	Semi-evergreen forests	July-December	Culms 60-200cm high, leaves plicately folded, panicle 15-25cm long, spikelets 3x1mm,palea lanceolate, anthers 2mm long
16	*Spodiopogon rhizophorous (Steud.)*	Semi-evergreen forests	November-January	50 cm long, spikelets in groups of three, stamens 3, ovary elliptic, styles 2
17	*Tripogon bromoides (Roem.&Schult.)*	Rocky grasslands	November - January	Culms 10-35cm high, raceme 10-30cm long, spikelets 0.5-1 cm, glabrous, lemma 3-4x1-2mm, palea 3x1mm,scabrid along the keels, anthers 1mmlong
18	*Zenkeria elegans (Trin.,L.)*	Open grasslands	June-December	40-100 cm long, leaves glabrous Spikelets 5-6 ×3mm, anthers 2 mm

There are 25 Species of grasses recognized as exotic alien species in the study area. These exotics indicate the degrading nature of grasslands that may be due to the activities of human beings related to agriculture and other programmes. Ecological niches are not due to the topography of a land but also a result of biotic and abiotic association of the plants and animal species that are present. On this basis each of the 77 Species of grasses especially the endemics are equally significant regarding the formation of a stable but becoming fragile ecosystem in Vagamon hills. It is also relevant that Vagamon hills maintain the water holding capacity, since it is the major water shed area of Meenachil river, which is responsible for the fertile nature of Eastern Sector of Kottayam district.

Conclusion

Grasses have wide ecological amplitude and must be exploited for eco-development of the regions devoid of biodiversity. The seasonal fire occurring in vagamon definitely paved way for the advent of many exotic Species including grasses. The replacement of these natural vegetation definitely changed the Soil structure that in turn affects the water holding capacity. This may also be a reason for genetic erosion of the plant species in these hills. It is to be note that these grasslands, though much disturbed by early pastors, tea plantations and recently by tourism, still possess a sizable plant diversity that can be equaled to any protected area in Kerala.

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(Received : 28.3.2014; Revised and accepted 10.5.2014)